#5

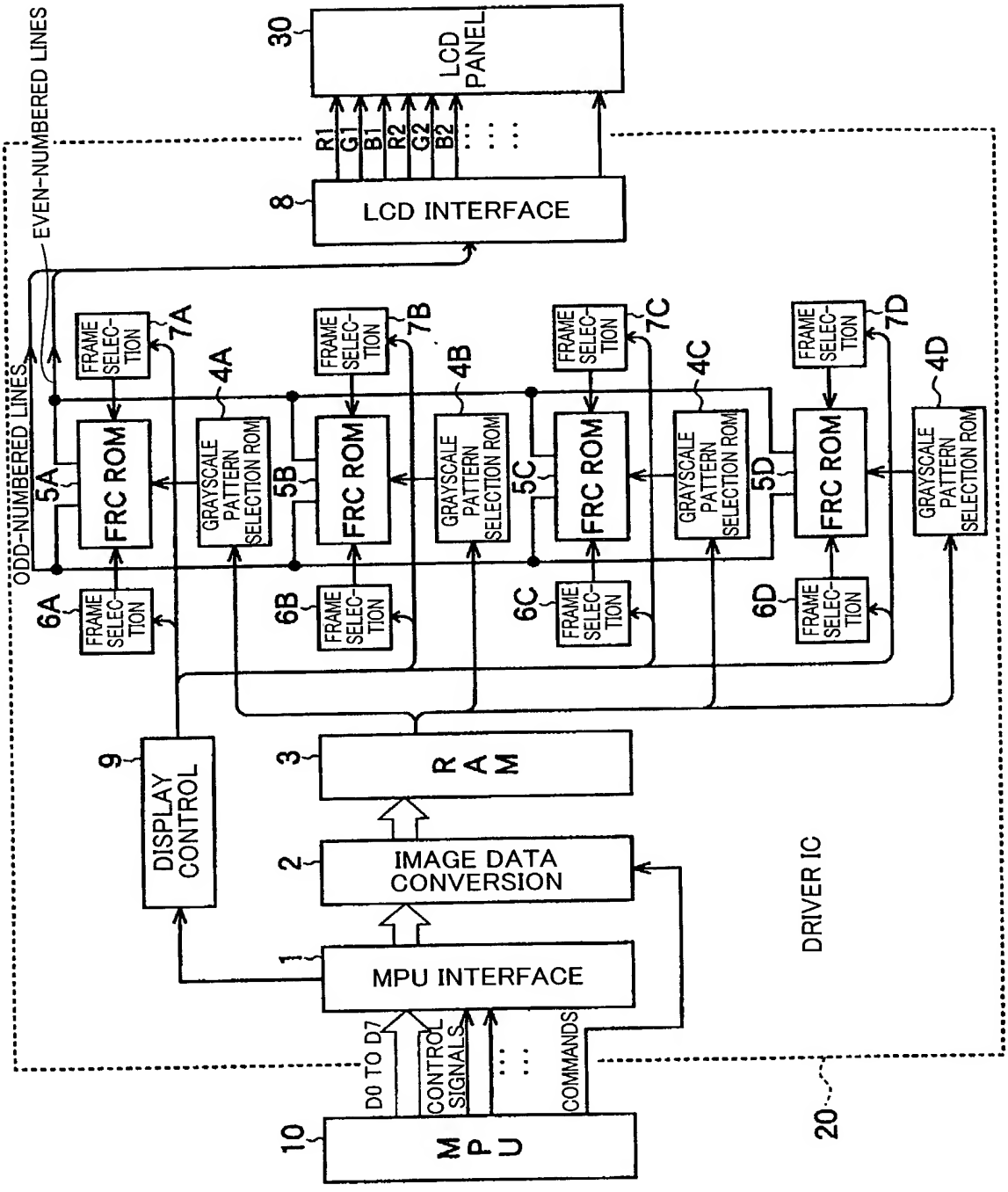
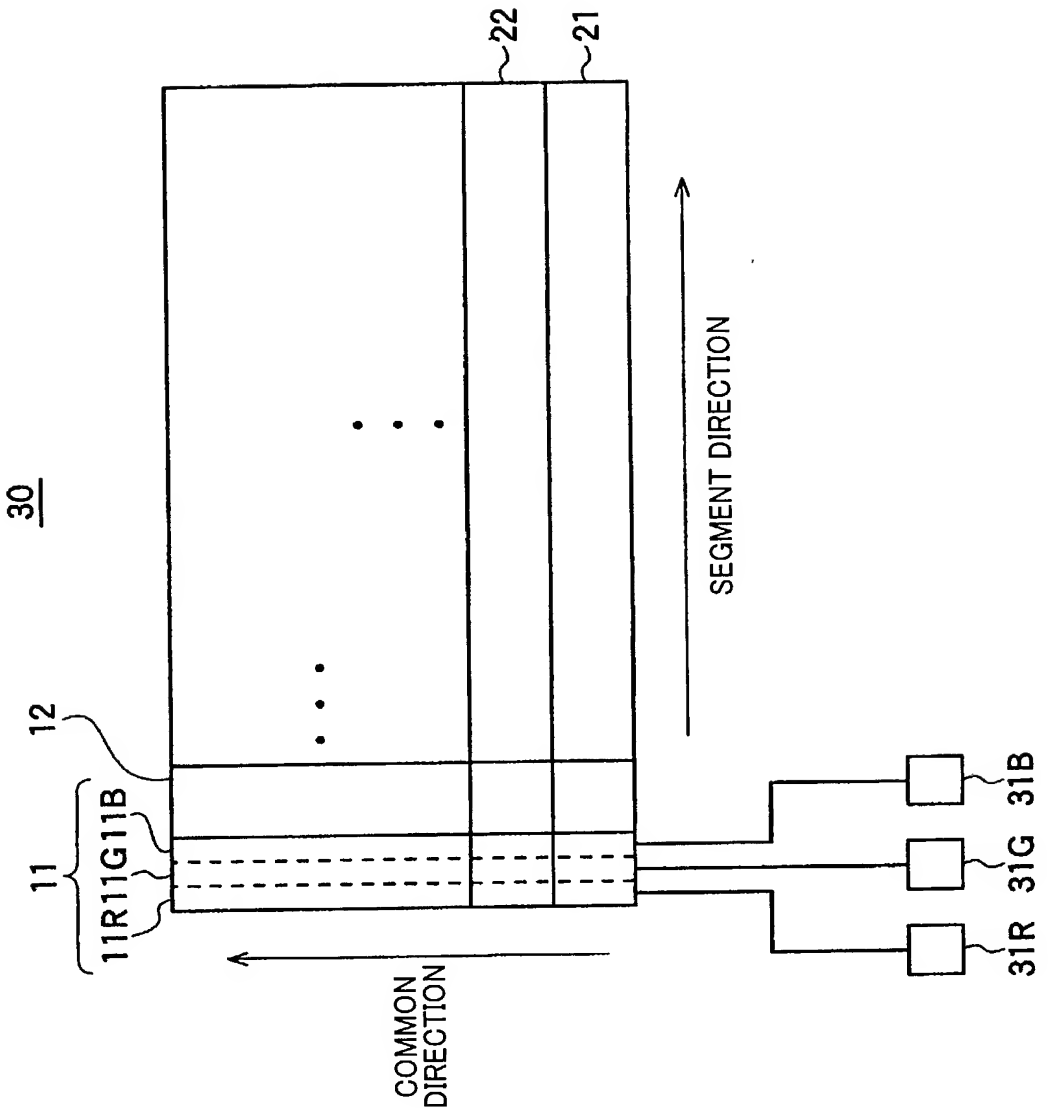

30
LCD PANEL
R1
G1
B1
R2
G2
B2
8
LCD INTERFACE
EVEN-NUMBERED LINES
ODD-NUMBERED LINES
FRAME SELEC-TION
7A
4A
5A
FRC ROM
GRAYSCALE PATTERN SELECTION ROM
6A
7B
4B
5B
6B
7C
4C
5C
7D
4D
5D
6C
6D
9
DISPLAY CONTROL
3
RAM
2
IMAGE DATA CONVERSION
1
MPU INTERFACE
D0 TO D7
CONTROL SIGNALS
COMMANDS
10
MPU
DRIVER IC
20

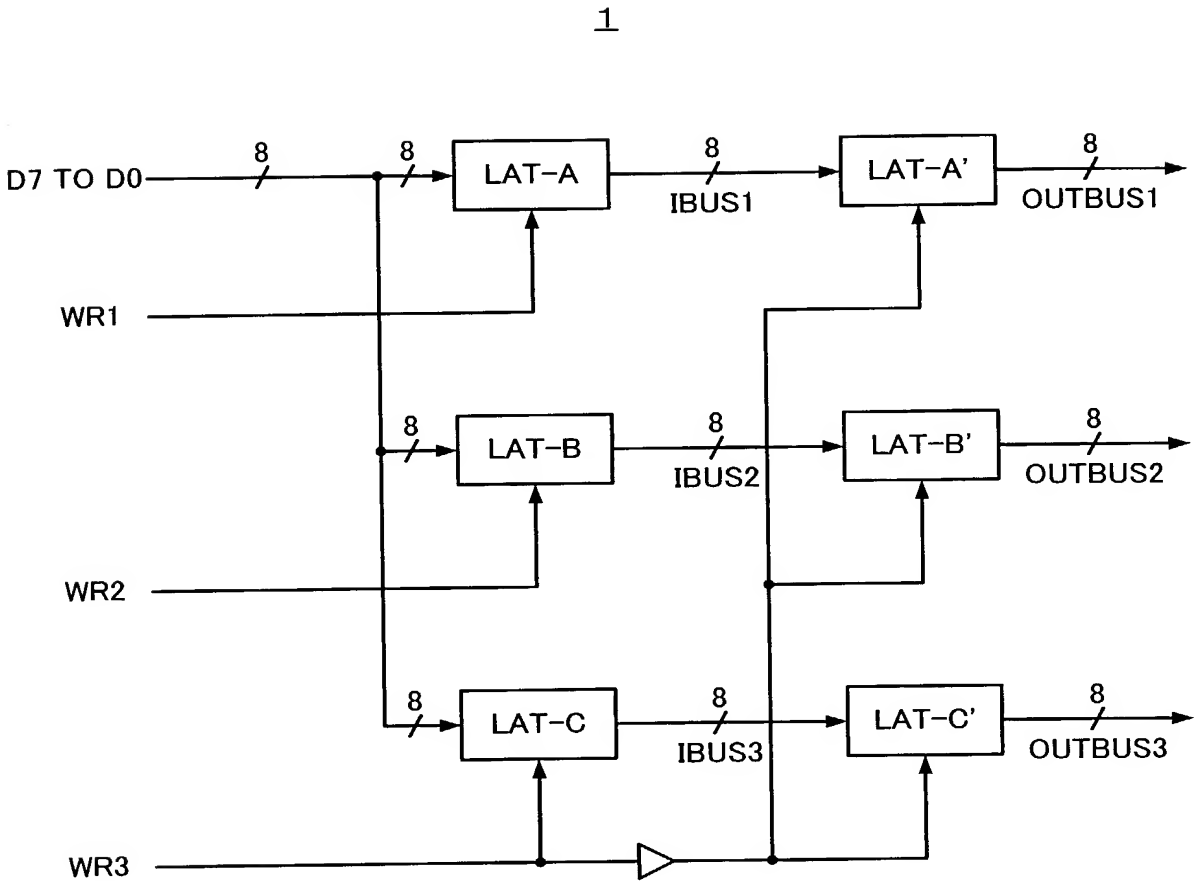
FIG. 1

FIG. 2


30
22
21
12
11
11R11G11B
SEGMENT DIRECTION
COMMON DIRECTION
31R
31G
31B

JP06216762.052302

FIG. 3



JP2006215152 A 20060817

FIG. 4A

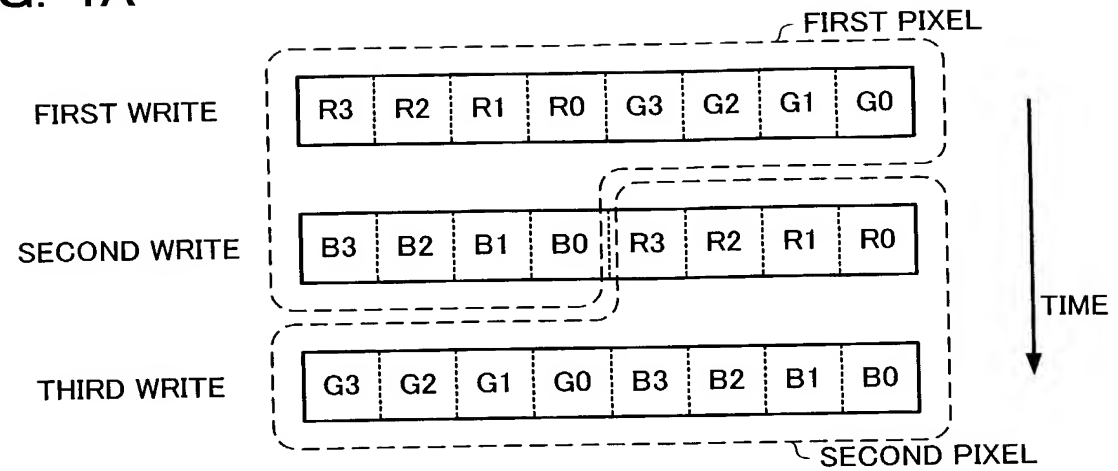
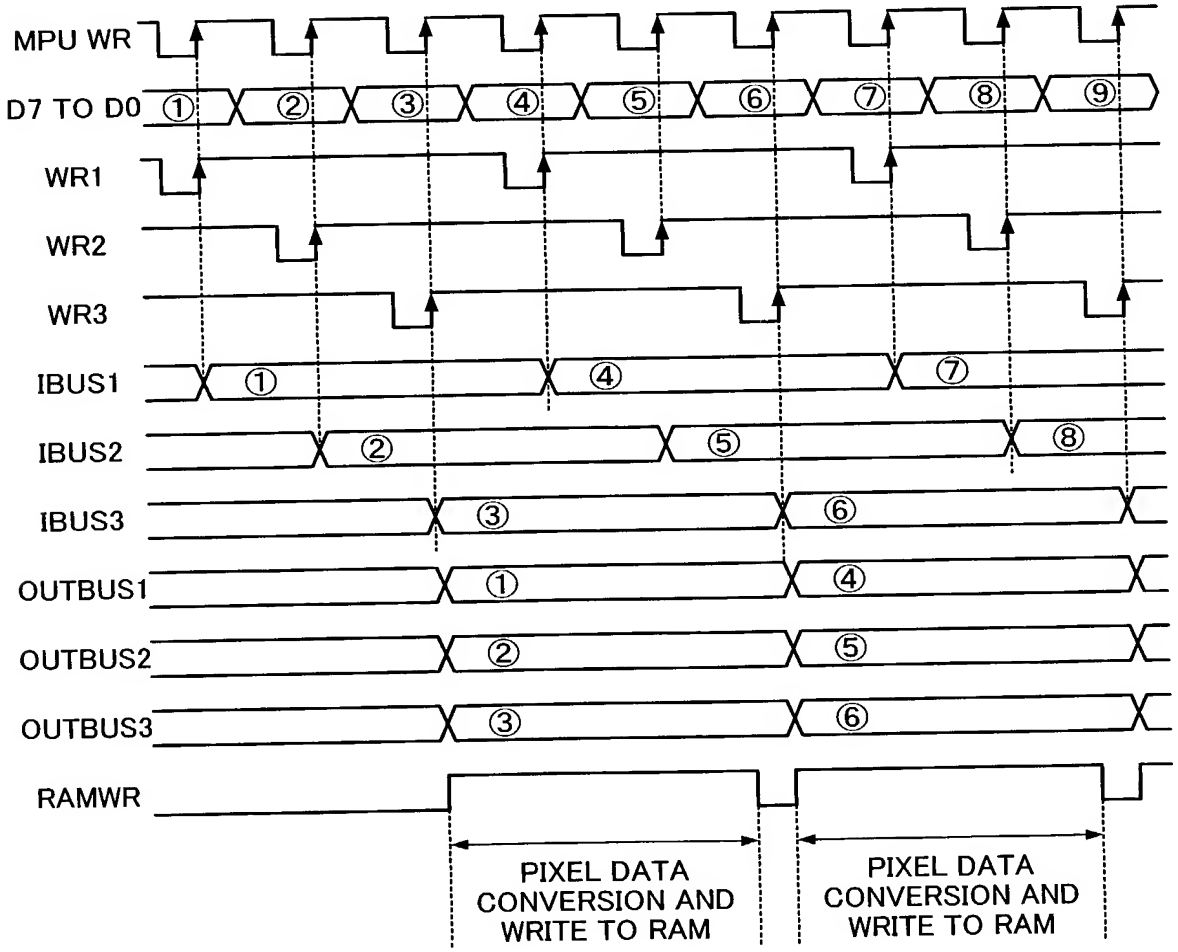


FIG. 4B



10/582,482 - 05/23/2008

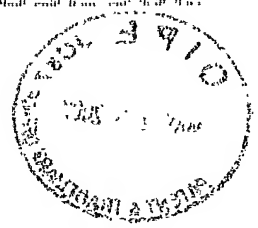


FIG. 5

COMMAND	D7	D6	D5	D4	D3	D2	D1	D0	PRE-CONVERSION 4-BIT IMAGE DATA
P1	*	*	*	P14	P13	P12	P11	P10	R(0,0,0,0)
P2	*	*	*	P24	P23	P22	P21	P20	R(0,0,0,1)
P3	*	*	*	P34	P33	P32	P31	P30	R(0,0,1,0)
P4	*	*	*	P44	P43	P42	P41	P40	R(0,0,1,1)
P5	*	*	*	P54	P53	P52	P51	P50	R(0,1,0,0)
P6	*	*	*	P64	P63	P62	P61	P60	R(0,1,0,1)
P7	*	*	*	P74	P73	P72	P71	P70	R(0,1,1,0)
P8	*	*	*	P84	P83	P82	P81	P80	R(0,1,1,1)
P9	*	*	*	P94	P93	P92	P91	P90	R(1,0,0,0)
P10	*	*	*	P104	P103	P102	P101	P100	R(1,0,0,1)
P11	*	*	*	P114	P113	P112	P111	P110	R(1,0,1,0)
P12	*	*	*	P124	P123	P122	P121	P120	R(1,0,1,1)
P13	*	*	*	P134	P133	P132	P131	P130	R(1,1,0,0)
P14	*	*	*	P144	P143	P142	P141	P140	R(1,1,0,1)
P15	*	*	*	P154	P153	P152	P151	P150	R(1,1,1,0)
P16	*	*	*	P164	P163	P162	P161	P160	R(1,1,1,1)
P17	*	*	*	P174	P173	P172	P171	P170	G(0,0,0,0)
P18	*	*	*	P184	P183	P182	P181	P180	G(0,0,0,1)
P19	*	*	*	P194	P193	P192	P191	P190	G(0,0,1,0)
P20	*	*	*	P204	P203	P202	P201	P200	G(0,0,1,1)
P21	*	*	*	P214	P213	P212	P211	P210	G(0,1,0,0)
P22	*	*	*	P224	P223	P222	P221	P220	G(0,1,0,1)
P23	*	*	*	P234	P233	P232	P231	P230	G(0,1,1,0)
P24	*	*	*	P244	P243	P242	P241	P240	G(0,1,1,1)
P25	*	*	*	P254	P253	P252	P251	P250	G(1,0,0,0)
P26	*	*	*	P264	P263	P262	P261	P260	G(1,0,0,1)
P27	*	*	*	P274	P273	P272	P271	P270	G(1,0,1,0)
P28	*	*	*	P284	P283	P282	P281	P280	G(1,0,1,1)
P29	*	*	*	P294	P293	P292	P291	P290	G(1,1,0,0)
P30	*	*	*	P304	P303	P302	P301	P300	G(1,1,0,1)
P31	*	*	*	P314	P313	P312	P311	P310	G(1,1,1,0)
P32	*	*	*	P324	P323	P322	P321	P320	G(1,1,1,1)
P33	*	*	*	P334	P333	P332	P331	P330	B(0,0,0,0)
P34	*	*	*	P344	P343	P342	P341	P340	B(0,0,0,1)
P35	*	*	*	P354	P353	P352	P351	P350	B(0,0,1,0)
P36	*	*	*	P364	P363	P362	P361	P360	B(0,0,1,1)
P37	*	*	*	P374	P373	P372	P371	P370	B(0,1,0,0)
P38	*	*	*	P384	P383	P382	P381	P380	B(0,1,0,1)
P39	*	*	*	P394	P393	P392	P391	P390	B(0,1,1,0)
P40	*	*	*	P404	P403	P402	P401	P400	B(0,1,1,1)
P41	*	*	*	P414	P413	P412	P411	P410	B(1,0,0,0)
P42	*	*	*	P424	P423	P422	P421	P420	B(1,0,0,1)
P43	*	*	*	P434	P433	P432	P431	P430	B(1,0,1,0)
P44	*	*	*	P444	P443	P442	P441	P440	B(1,0,1,1)
P45	*	*	*	P454	P453	P452	P451	P450	B(1,1,0,0)
P46	*	*	*	P464	P463	P462	P461	P460	B(1,1,0,1)
P47	*	*	*	P474	P473	P472	P471	P470	B(1,1,1,0)
P48	*	*	*	P484	P483	P482	P481	P480	B(1,1,1,1)

FIG. 6

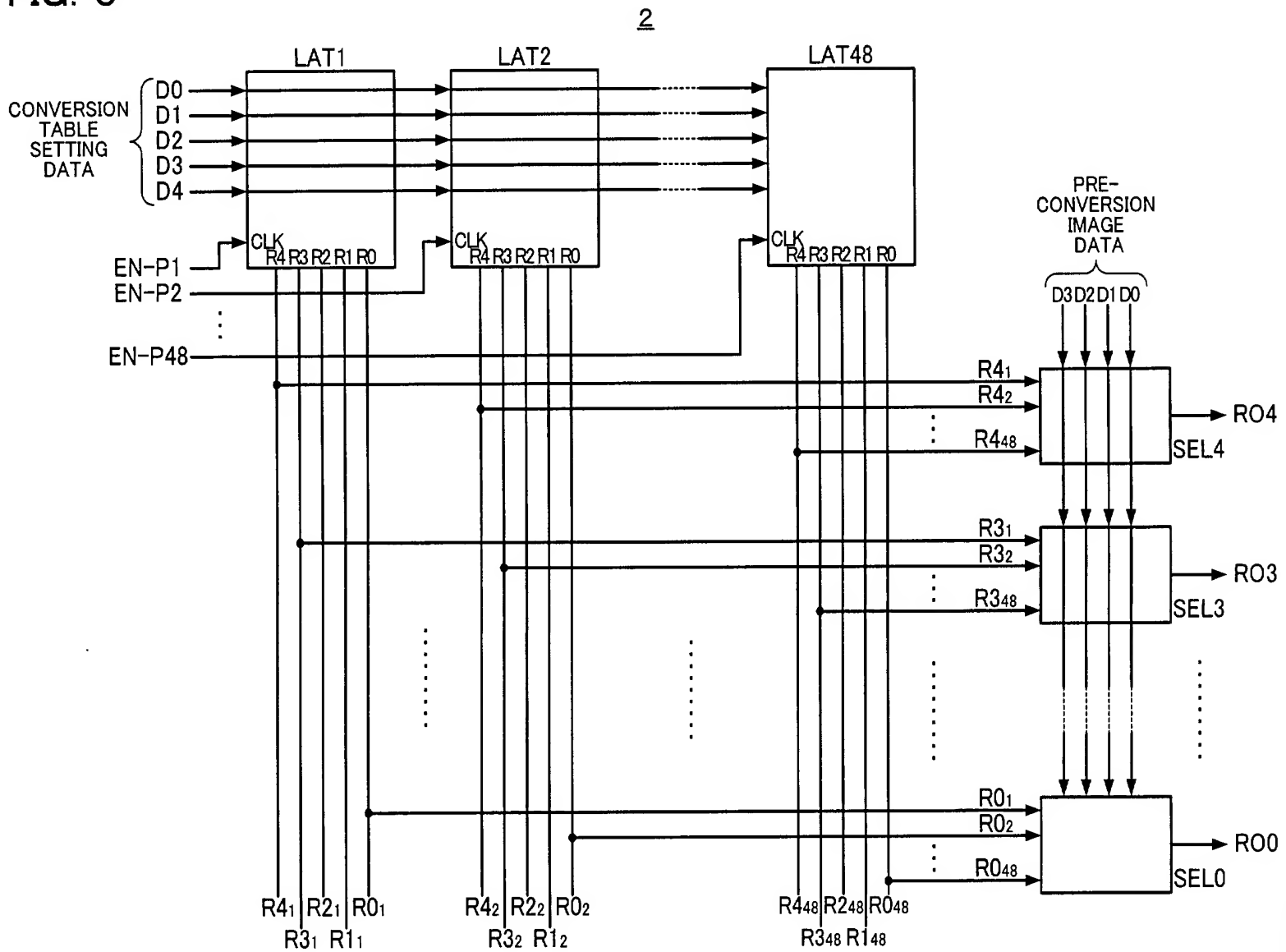
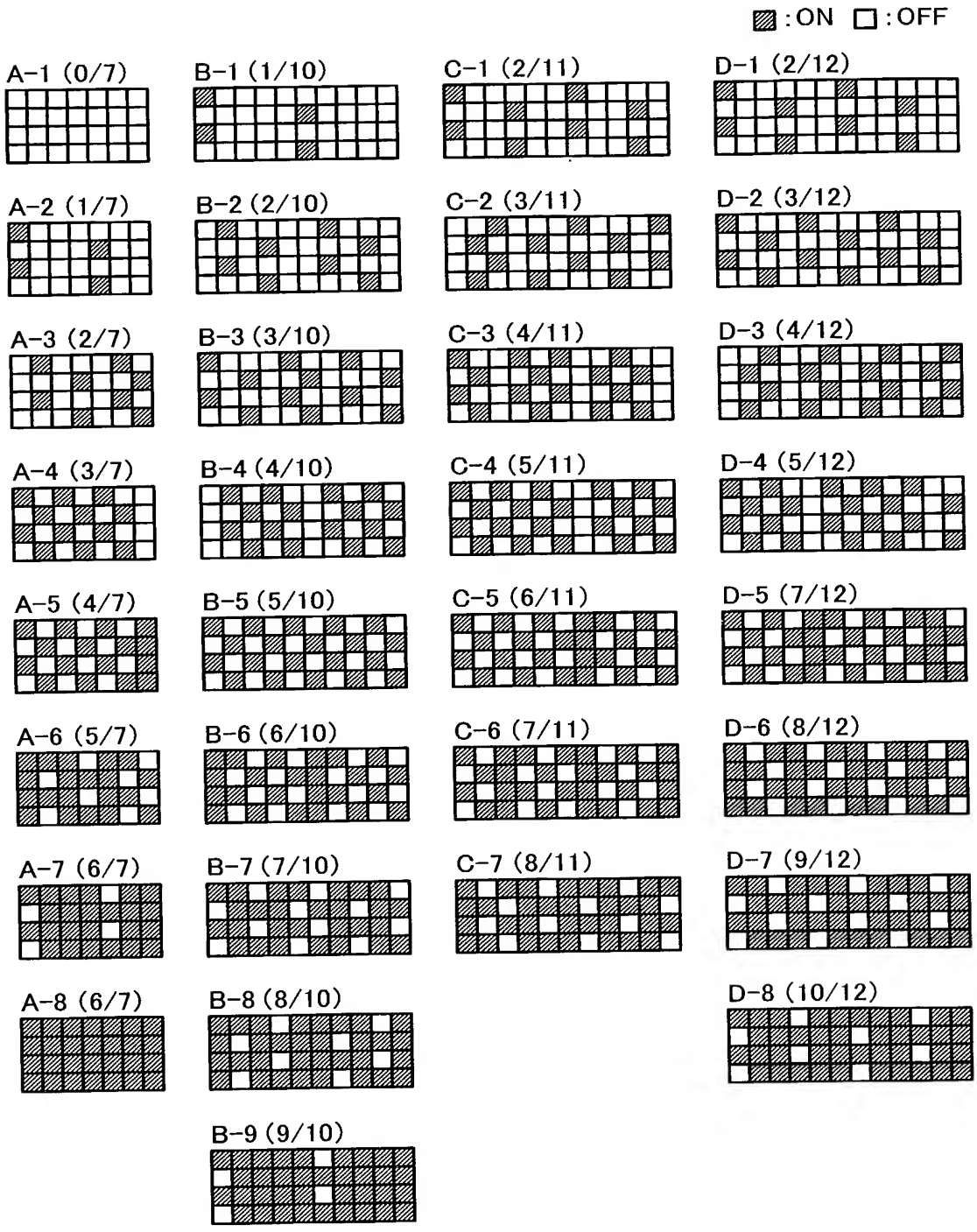

2
LAT1
LAT2
LAT48
CONVERSION TABLE SETTING DATA
D0
D1
D2
D3
D4
CLK
R4 R3 R2 R1 R0
EN-P1
EN-P2
EN-P48
PRE-CONVERSION IMAGE DATA
D3 D2 D1 D0
R41
R42
R448
RO4
SEL4
R31
R32
R348
RO3
SEL3
R01
R02
R048
RO0
SEL0
R41 R21 R01
R31 R11
R42 R22 R02
R32 R12
R448 R248 R048
R348 R148

FIG. 7


▨:ON □:OFF
A-1 (0/7)
B-1 (1/10)
C-1 (2/11)
D-1 (2/12)
A-2 (1/7)
B-2 (2/10)
C-2 (3/11)
D-2 (3/12)
A-3 (2/7)
B-3 (3/10)
C-3 (4/11)
D-3 (4/12)
A-4 (3/7)
B-4 (4/10)
C-4 (5/11)
D-4 (5/12)
A-5 (4/7)
B-5 (5/10)
C-5 (6/11)
D-5 (7/12)
A-6 (5/7)
B-6 (6/10)
C-6 (7/11)
D-6 (8/12)
A-7 (6/7)
B-7 (7/10)
C-7 (8/11)
D-7 (9/12)
A-8 (6/7)
B-8 (8/10)
D-8 (10/12)
B-9 (9/10)

JP03PH02 .05.3305

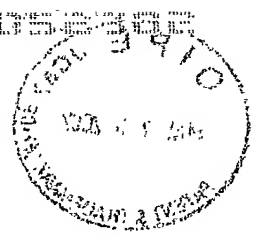


FIG. 8

No.	GRAYSCALE	RATIO	DIFFERENCE
0	0/7	0.000	---
1	1/10	0.100	0.100
2	1/7	0.143	0.043
3	2/12	0.167	0.024
4	2/11	0.182	0.015
5	2/10	0.200	0.018
6	3/12	0.250	0.050
7	3/11	0.273	0.023
8	2/7	0.286	0.013
9	3/10	0.300	0.014
10	4/12	0.333	0.033
11	4/11	0.364	0.030
12	4/10	0.400	0.036
13	5/12	0.417	0.017
14	3/7	0.429	0.012
15	5/11	0.455	0.026
16	5/10	0.500	0.045
17	6/11	0.545	0.045
18	4/7	0.571	0.026
19	7/12	0.583	0.012
20	6/10	0.600	0.017
21	7/11	0.636	0.036
22	8/12	0.667	0.030
23	7/10	0.700	0.033
24	5/7	0.714	0.014
25	8/11	0.727	0.013
26	9/12	0.750	0.023
27	8/10	0.800	0.050
28	10/12	0.833	0.033
29	6/7	0.857	0.024
30	9/10	0.900	0.043
31	7/7	1.000	0.100

FIG. 9

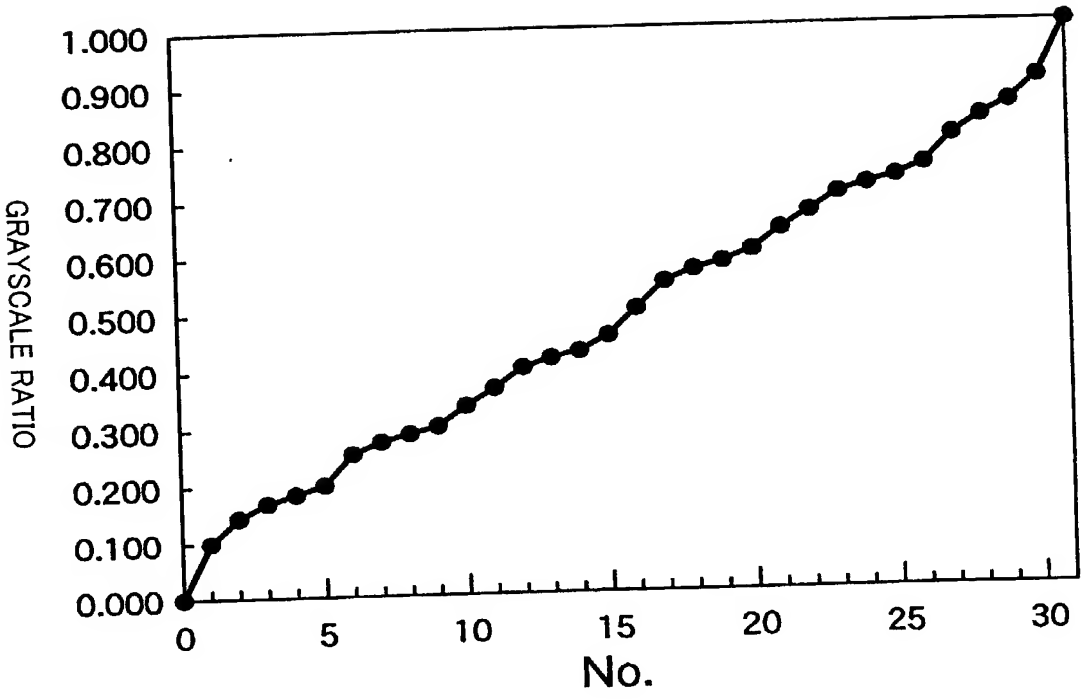

1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
GRAYSCALE RATIO
0
5
10
15
20
25
30
No.

FIG. 10

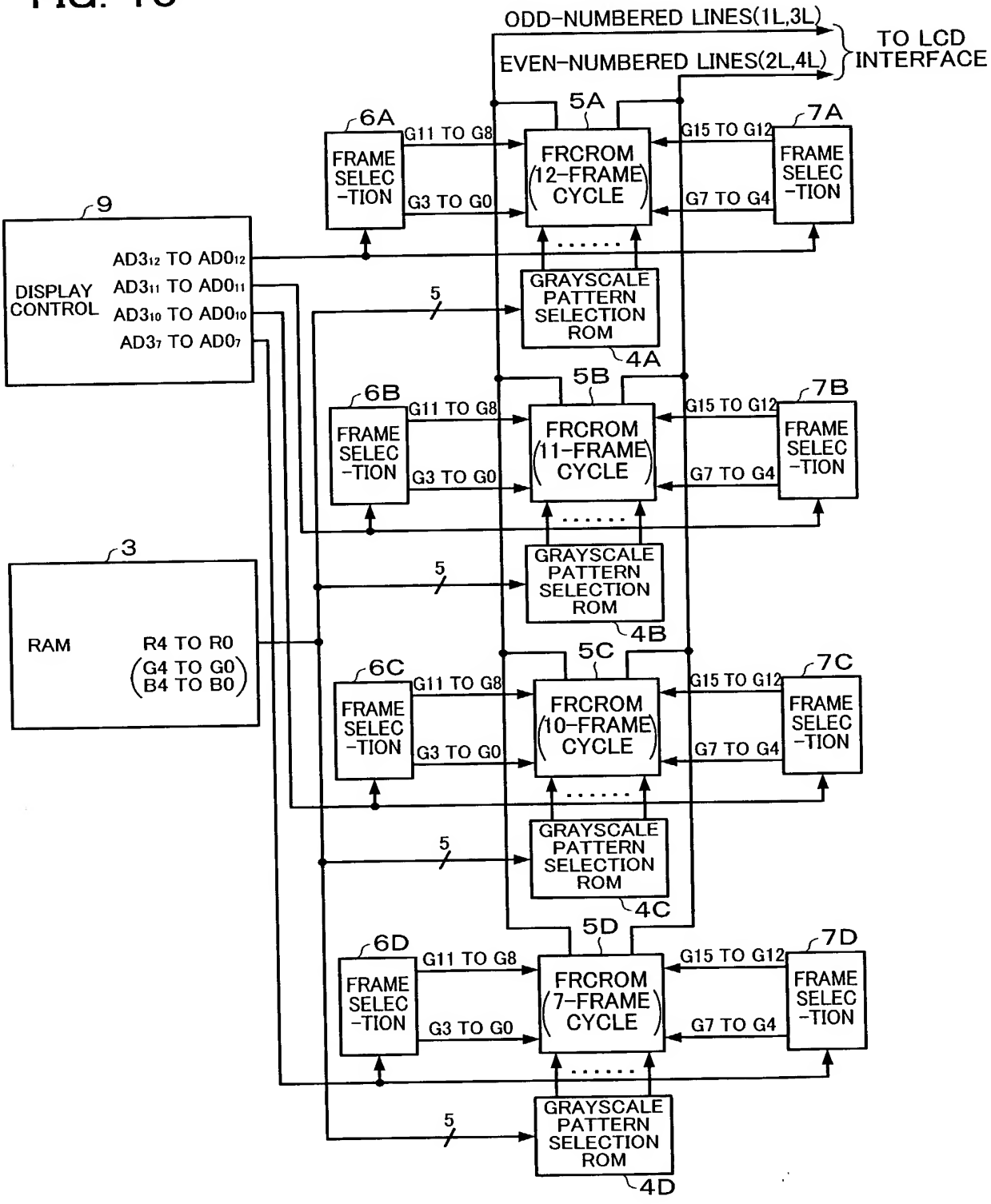

ODD-NUMBERED LINES(1L,3L)
EVEN-NUMBERED LINES(2L,4L)
TO LCD INTERFACE
9
DISPLAY CONTROL
AD3₁₂ TO AD0₁₂
AD3₁₁ TO AD0₁₁
AD3₁₀ TO AD0₁₀
AD3₇ TO AD0₇
3
RAM
R4 TO R0
(G4 TO G0 B4 TO B0)
5
6A
FRAME SELEC -TION
G11 TO G8
G3 TO G0
5A
FRCROM (12-FRAME CYCLE)
G15 TO G12
G7 TO G4
7A
FRAME SELEC -TION
GRAYSCALE PATTERN SELECTION ROM
4A
6B
5B
FRCROM (11-FRAME CYCLE)
7B
4B
6C
5C
FRCROM (10-FRAME CYCLE)
7C
4C
6D
5D
FRCROM (7-FRAME CYCLE)
7D
4D

FIG. 11

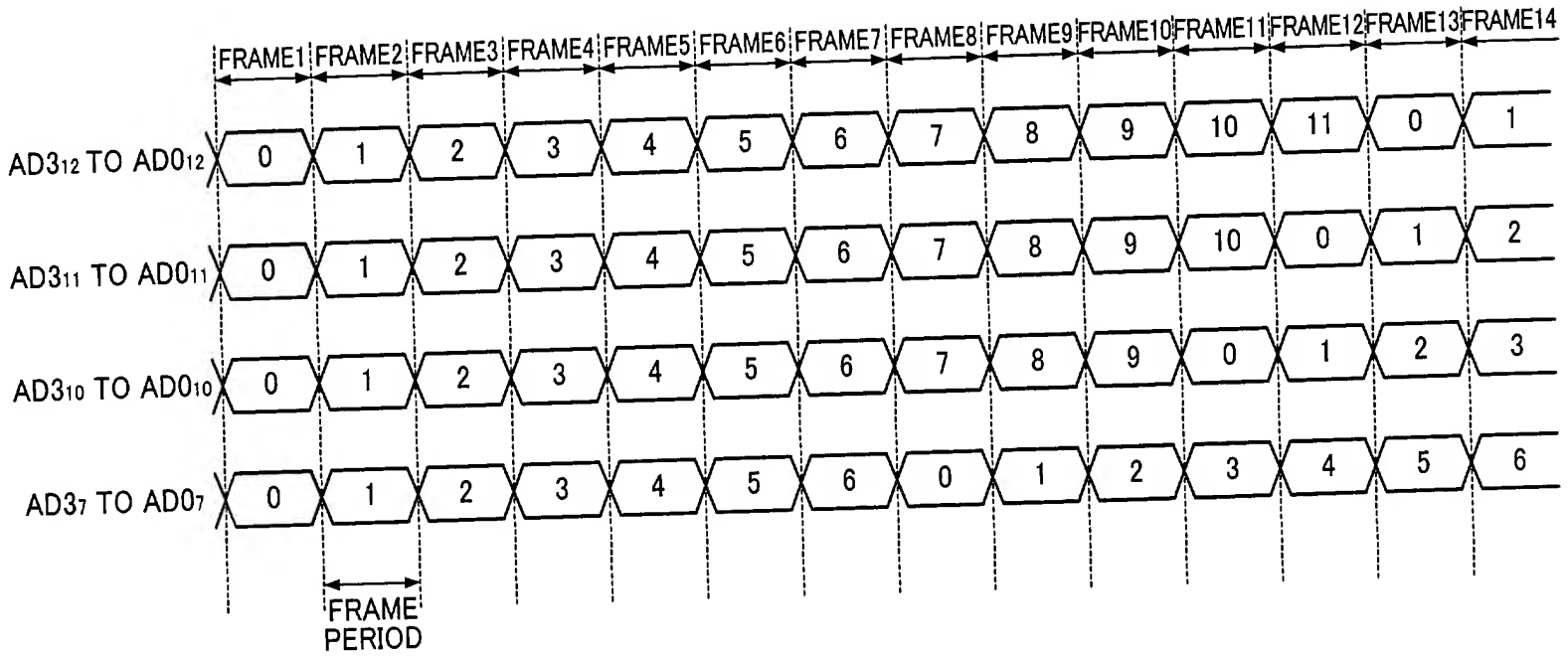

FRAME1
FRAME2
FRAME3
FRAME4
FRAME5
FRAME6
FRAME7
FRAME8
FRAME9
FRAME10
FRAME11
FRAME12
FRAME13
FRAME14
AD3₁₂ TO AD0₁₂
AD3₁₁ TO AD0₁₁
AD3₁₀ TO AD0₁₀
AD3₇ TO AD0₇
FRAME PERIOD

FIG. 12

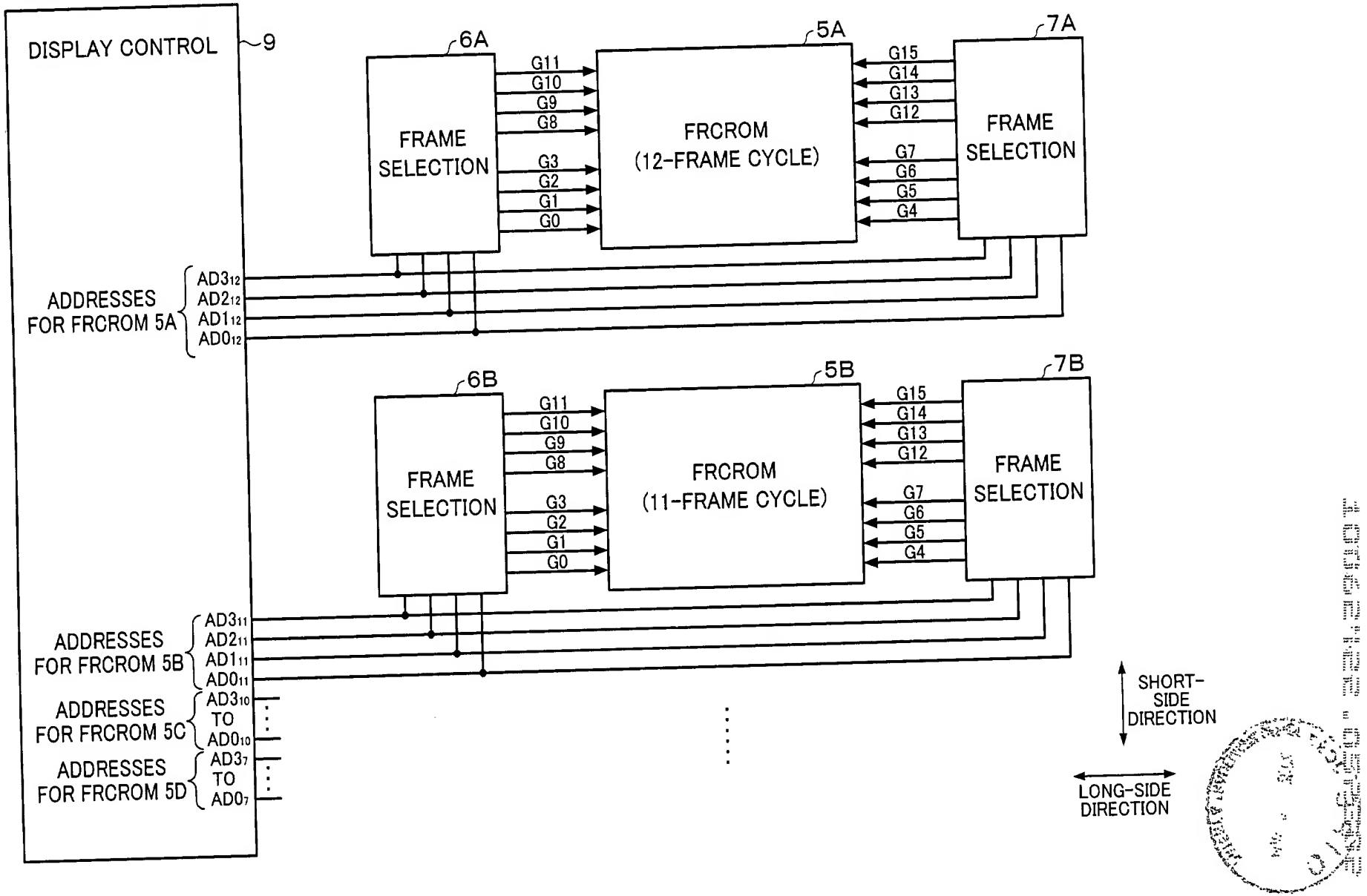
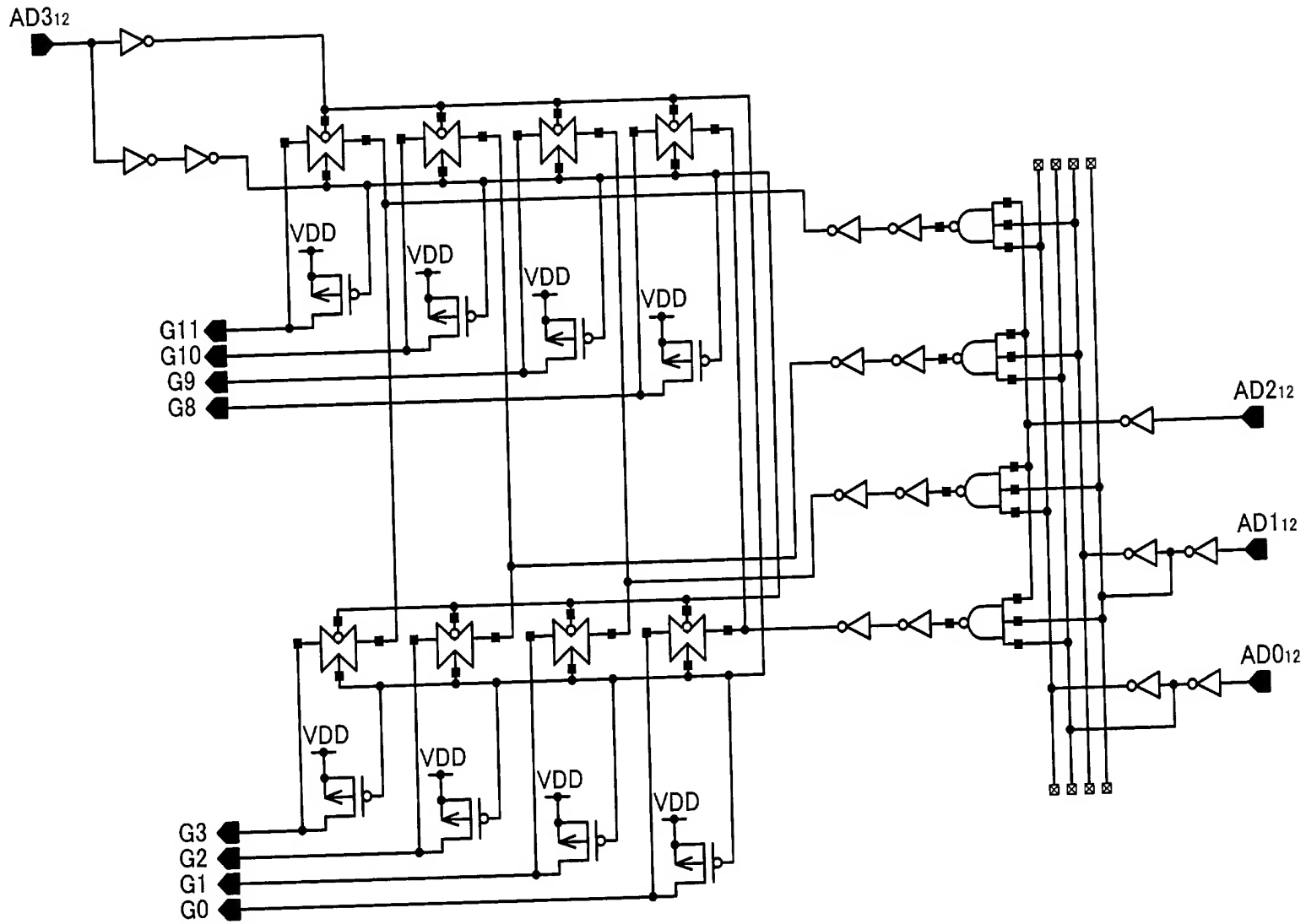

DISPLAY CONTROL
9
6A
FRAME SELECTION
G11
G10
G9
G8
G3
G2
G1
G0
5A
FRCROM (12-FRAME CYCLE)
G15
G14
G13
G12
G7
G6
G5
G4
7A
FRAME SELECTION
ADDRESSES FOR FRCROM 5A
AD3₁₂
AD2₁₂
AD1₁₂
AD0₁₂
6B
FRAME SELECTION
G11
G10
G9
G8
G3
G2
G1
G0
5B
FRCROM (11-FRAME CYCLE)
G15
G14
G13
G12
G7
G6
G5
G4
7B
FRAME SELECTION
ADDRESSES FOR FRCROM 5B
AD3₁₁
AD2₁₁
AD1₁₁
AD0₁₁
ADDRESSES FOR FRCROM 5C
AD3₁₀ TO AD0₁₀
ADDRESSES FOR FRCROM 5D
AD3₇ TO AD0₇
SHORT-SIDE DIRECTION
LONG-SIDE DIRECTION

FIG. 13


6A
AD312
VDD
VDD
VDD
VDD
G11
G10
G9
G8
AD212
AD112
AD012
VDD
VDD
VDD
VDD
G3
G2
G1
G0

JP06214562

FIG. 14

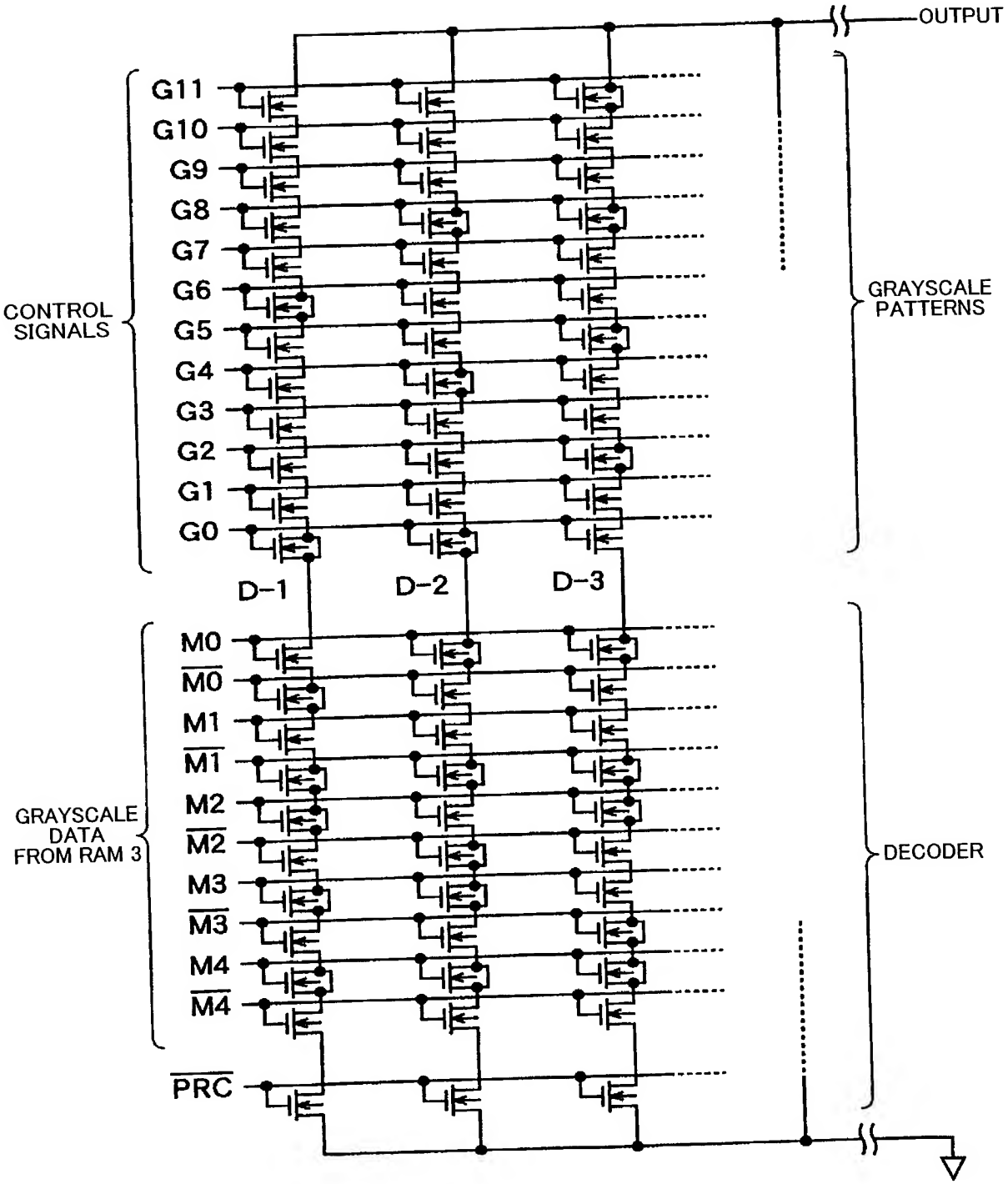


FIG. 15

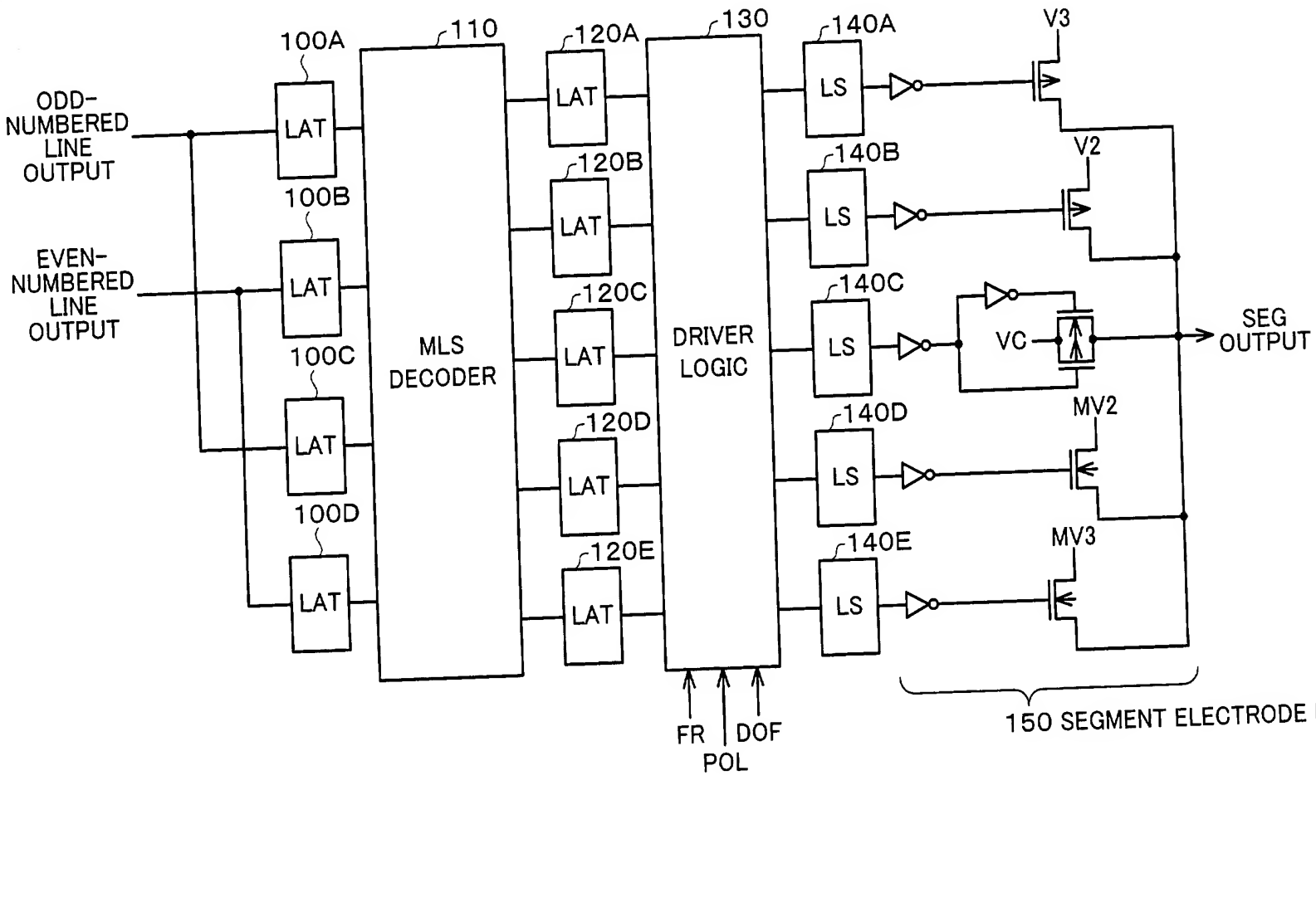

8
ODD-NUMBERED LINE OUTPUT
EVEN-NUMBERED LINE OUTPUT
100A
100B
100C
100D
LAT
MLS DECODER
110
120A
120B
120C
120D
120E
130
DRIVER LOGIC
FR
DOF
POL
140A
140B
140C
140D
140E
LS
V3
V2
MV2
MV3
VC
SEG OUTPUT
150 SEGMENT ELECTRODE DRIVE

FIG. 16

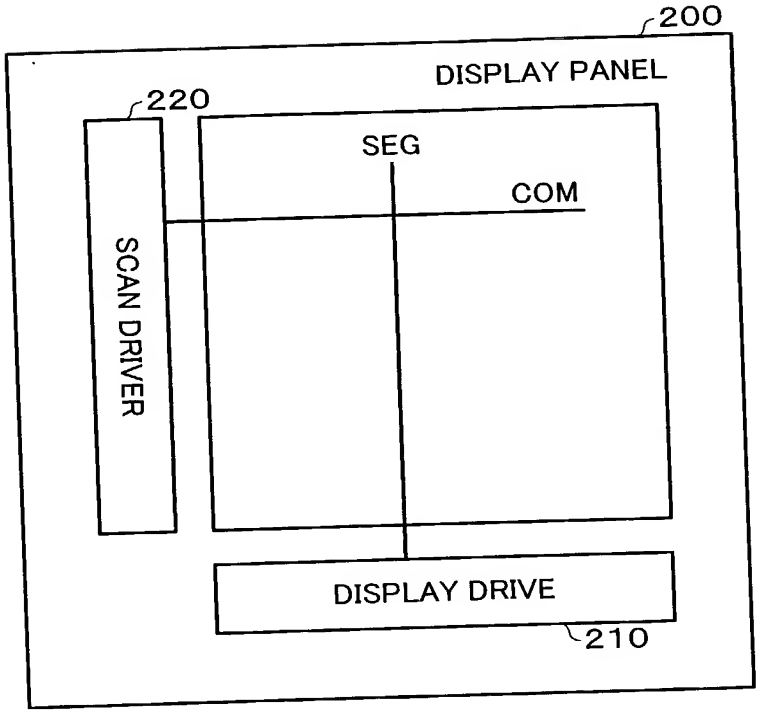
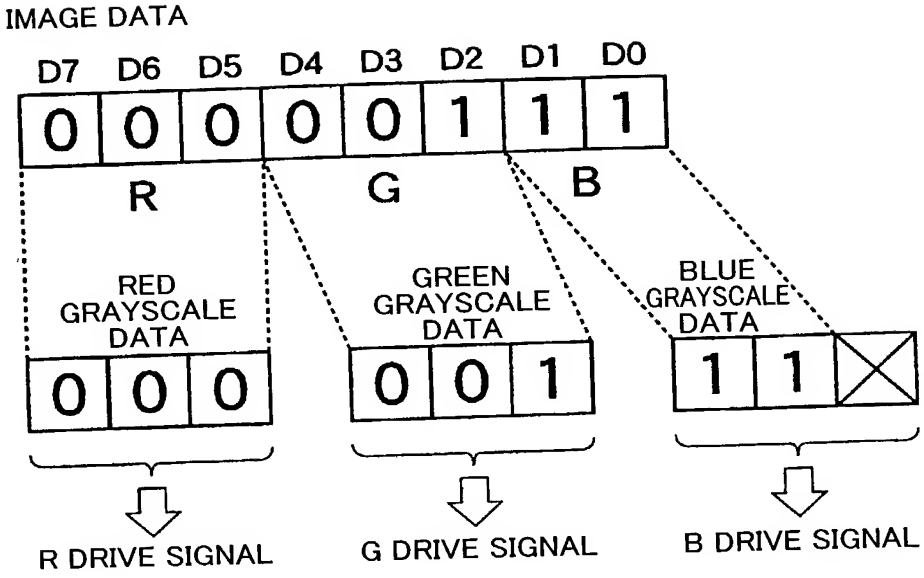


FIG. 17

PRIOR ART